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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/646,680	11/04/2000	Hideo Yamanaka	SON-1782/KO1	5089

7590 03/27/2002

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EXAMINER

FULLER, ERIC B

ART UNIT	PAPER NUMBER
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1762

7

DATE MAILED: 03/27/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

VIF-7

Office Action Summary	Application No. 09/646,680	Applicant(s) YAMANAKA ET AL.	
	Examiner Eric B Fuller	Art Unit 1762	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 January 2002.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-45 is/are pending in the application.
- 4a) Of the above claim(s) 3-7, 10-13, 15, 18, 19 and 22-45 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1, 2, 8, 9, 14, 16, 17, 20 and 21 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☒ Claim(s) 1-45 are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
 If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 a) ☒ All b) ☐ Some * c) ☐ None of:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
 * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
 a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) <u>1</u> . | 6) <input type="checkbox"/> Other: |

DETAILED ACTION

Election/Restrictions

In response to Applicant response stating that the previous restriction made was confusing, it has been withdrawn and replaced by the following:

Restriction is required under 35 U.S.C. 121 and 372.

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1.

In accordance with 37 CFR 1.499, applicant is required, in reply to this action, to elect a single invention to which the claims must be restricted.

Group I, claim(s) 1-22, drawn to a method.

Group II, claim(s) 23-45, drawn to an apparatus.

The inventions listed as Groups I and II do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: The heated catalyzor is all ready known in the art of vapor deposition, as evident in Miyoshi (US 6,225,241 B1) and applying an electric field is all ready known in the art of vapor deposition, as evident in Foster et al. (US 4,668,365). Therefore, these two groups lack a shared special technical feature.

This application contains claims directed to more than one species of the generic invention. These species are deemed to lack unity of invention because they are not so linked as to form a single general inventive concept under PCT Rule 13.1.

The species are as follows:

Species 1 – Embodiment 1, pages 18-35, Figs. 1-6 ;

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- Species 2 – Embodiment 2, pages 35-36, Fig. 7 ;
- Species 3 – Embodiment 3, page 36, Fig. 8;
- Species 4 – Embodiment 4, pages 36-37, Fig. 9;
- Species 5 – Embodiment 5, page 37, Figs. 10-11;
- Species 6 – Embodiment 6, pages 37-38, Fig. 12;
- Species 7 – Embodiment 7, pages 38-40, Figs. 13-16;
- Species 8 – Embodiment 8, pages 41-48, Fig. 17;
- Species 9 – Embodiment 9, pages 41-48 Figs. 18-19;
- Species 10 – Embodiment 10, pages 48-49, Fig. 20;
- Species 11 – Embodiment 11, pages 49-50, Fig. 21;
- Species 12 – Embodiment 12, pages 50-53, Fig. 22;
- Species 13 – Embodiment 13, pages 53, Fig. 23.

Applicant is required, in reply to this action, to elect a single species to which the claims shall be restricted if no generic claim is finally held to be allowable. The reply must also identify the claims readable on the elected species, including any claims subsequently added. An argument that a claim is allowable or that all claims are generic is considered non-responsive unless accompanied by an election.

Upon the allowance of a generic claim, applicant will be entitled to consideration of claims to additional species which are written in dependent form or otherwise include all the limitations of an allowed generic claim as provided by 37 CFR 1.141. If claims are added after the election, applicant must indicate which are readable upon the elected species. MPEP § 809.02(a).

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The claims are deemed to correspond to the species listed above in the following manner:

Species 1 – claims 1, 2, 8, 9, 14, 16, 17, 20, 21, 23, 24, 30, 31, 36, 38, 39, 42, 43, and 45;
Species 2 – claims 12, 13, 34, and 35;
Species 3 – claims 10, 11, 32, and 33;
Species 4 – no claim;
Species 5 – claim 11 and 33;
Species 6 – no claim;
Species 7 – claim 15 and 37;
Species 8 – no claim;
Species 9 – claims 3-7 and 25-29;
Species 10 – no claim;
Species 11 – claims 3-5 and 25-27;
Species 12 – claims 3-7 and 25-29;
Species 13 – claims 18, 19, 22, 40, 41, and 44.

The following claim(s) are generic: 1 and 23.

The species listed above do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, the species lack the same or corresponding special technical features for the reasons given in the previous action.

In the previous action, the species of Group I was excluded, although proper.

However, Applicant stated in the communications filed January 22, 2002, an election was made with traverse to prosecute the invention of Group I and that if a selection of species requirement is necessary, species 1 of Group 1 would be elected. Therefore, Examiner has treated this election as a provisional election of Group I, species 1, claims 1, 2, 8, 9, 14, 16, 17, 20, and 21. Applicant in replying to this Office action must make affirmation of this election. Claims 3-7, 10-13, 15, 18, 19, and 22-45 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Applicant's traversal on the grounds that the corresponding International Application has not been restricted for a lack of unity has been considered, but is unconvincing. Each individual case is separately examined. Examiner has clearly shown there is no shared special technical feature between the groups and species.

Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 16 and 17 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

As to claim 16, applicant claims a temperature range of 800 to 2000 degrees Celsius and lower than its melting point. It is unclear, with the three range points, if applicant is claiming temperatures above 2000 degrees Celsius in cases where the melting point would be above 2000 degrees Celsius. For the purpose of examination, Examiner assumes 2000 degrees Celsius to be the maximum claimed temperature for

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higher melting point materials and the melting point temperature being the highest allowable temperature in cases where it is less than 2000 degrees Celsius.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 2, 16, 17, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miyoshi (US 6,225,241 B1) in view of Foster et al. (US 4,668,365).

Miyoshi teaches a process where silane and ammonia gas are flowed over a heated catalyzer. This causes the reactive gases to form a SiN film on a substrate (column 4, lines 16-27). This reference fails to teach the use of an electric field to provide kinetic energy to the reactive gases, such as a DC bias applied to the substrate.

However, it is known in the art that as silane is passed over a catalyzer, radical hydrogen ions are produced. Evidence that this is known is provided in the applicant's disclosure on page 3, second paragraph. Additionally, Foster teaches that it is a "well-known fact that low DC bias and the resulting relatively low-energy ion bombardment result in low substrate and film defect densities" (column 8, lines 32-34). Although the gas in Foster is plasma, it is realized that the DC bias would cause the hydrogen ions of Miyoshi to undergo ion-bombardment of the substrate. Therefore, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to

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utilize a DC bias in the process taught by Miyoshi. By doing so, substrate and film defect densities would be reduced. Examiner interprets "low DC bias" as to mean a voltage that is below the glow discharge starting voltage. This meets the limitations of claims 1 and 2.

As to claim 16, Miyoshi teaches that the catalyst is heated to 1300 – 1500 degrees Celsius and the substrate is heated to 300 – 400 degrees Celsius (column 4, lines 18-25).

As to claims 17 and 20, Miyoshi fails to teach that the catalyst is heated by its own resistance heating, but does teach that the catalyst is tungsten (column 4, line 24). Since resistance heating is a well-known method of heating tungsten to a high temperature (such as filaments in light bulbs), to heat the tungsten by resistance heating would have been obvious at the time the invention was made to a person having ordinary skill in the art.

Claims 8 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miyoshi (US 6,225,241 B1) in view of Foster et al. (US 4,668,365) as applied to claim 1 above, and further in view of Tseng et al. (US 6,291,343 B1).

Miyoshi and Foster, collectively, teach the limitations of claim 1, but are silent to where the electrode is located. However, Tseng teaches a process for causing ion-bombardment to a substrate in which a film is to be deposited on. In order to control (accelerate) the ions for the longest period of time, the showerhead that introduces the gases is also the electrode supplying the DC bias (column 6, lines 36-51). It would

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have been obvious at the time the invention was made to a person having ordinary skill in the art to have the gas inlet of the process taught by Miyoshi and Foster also be the electrode supplying the DC bias. As the catalyzer of Miyoshi, which produces the ions, is located in the chamber, having the electrode also be the gas inlet port would result in the same benefit of accelerating the ions for the longest possible amount of time. The longer the ions are accelerated, the less voltage is needed in order to achieve the same bombardment speed. This arrangement of having the electrode also be the gas inlet port and having the catalyzer placed in the chamber gives the arrangement claimed by the applicant in claims 8 and 9.

Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Miyoshi (US 6,225,241 B1) in view of Foster et al. (US 4,668,365) as applied to claim 1 above, and further in view of .Doi (US 5,900,161).

Miyoshi and Foster teach the limitations of claim 1, but fail to teach process of cleaning the deposition chamber after the coated substrate has been taken out. However, Doi teaches a plasma, self-cleaning technique where fluorine radicals are produced by an electric-discharge plasma. This process eliminates silicone-containing compounds that get deposited on the inner walls of the chamber (column 1, lines 45-51). It would have been obvious at the time the invention was made to a person having ordinary skill in the art to remove the SiN-coated substrate of Miyoshi from the deposition chamber and then generate a plasma discharge by the electrodes that are all

ready present in the chamber. By adding a fluorine gas to the chamber, the insides of the chamber are cleaned from the silicone-containing compounds.

Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Miyoshi (US 6,225,241 B1) in view of Foster et al. (US 4,668,365) as applied to claim 1 above, and further in view of Schrank (US 3,769,670).

Miyoshi and Foster teach the limitations of claim 1, but fails to teach that the catalyzer being heated in a hydrogen-based atmosphere before supplying the material gas. However, Schrank teaches that because tungsten readily oxidizes when heated, it is necessary to use reducing atmospheres, such as hydrogen, when heating (column 1, lines 15-20). This reference further teaches that hydrogen bromide is preferred as the atmosphere gas when heating tungsten to temperatures of about 1500 degrees Celsius (column 1, lines 35-42). It would have been obvious at the time the invention was made to a person having ordinary skill in the art to heat the tungsten catalyzer of Miyoshi in a hydrogen bromide atmosphere prior to introducing the material gases. By doing so, oxidation of the catalyzer would be reduced or prevented. Examiner interprets hydrogen bromide gas to be a hydrogen-based gas.

Conclusion

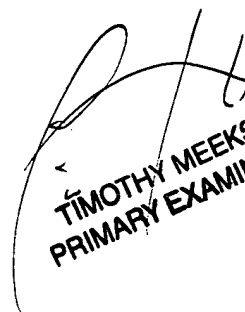
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eric B Fuller whose telephone number is (703) 308-6544. The examiner can normally be reached on Tuesday through Friday.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shrive Beck can be reached on (703) 308-2333. The fax phone numbers for the organization where this application or proceeding is assigned are 703 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

EBF
March 21, 2002


TIMOTHY MEEKS
PRIMARY EXAMINER